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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/582,259

02/21/2007

Bertrand Leroux

Serie 6439

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AIR LIQUIDE

Intellectual Property

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HOUSTON, TX 77056

EXAMINER

NDUBIZU, CHUKA CLEMENT

ART UNIT

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3743

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/582,259	Applicant(s) LEROUX ET AL.	
	Examiner CHUKA C. NDUBIZU	Art Unit 3743	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 November 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 16-21, 23-26, 29 and 30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 25 and 26 is/are allowed.
- 6) ☒ Claim(s) 16-21, 23-24, 29-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

Amendment filed on November 18 2009 is acknowledged.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 16-21, 23-24 and 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dugue et al 6,910,879 in view of Khinkis 4,761,132. Dugue teaches the invention as claimed (fig 1-6).

With regard to claim 16 Dugue discloses (fig 3) a jet of fuel and at least two jets of oxygen-rich oxygenated gas, the first jet of oxygen-rich oxygenated gas 32 (through 28), called the primary jet, being injected so as to be in contact with the jet of fuel 31 (column 7 lines 10-12) and so as to generate incomplete first combustion (column 8

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lines 50-51), the gases output by this first combustion still including at least one portion of the fuel, and the second jet of oxygen-rich oxygenated gas 30 (through 27) being injected at a distance $L1$ ($d1$) from the jet of fuel so as to combust with a first portion of the fuel present in the gases output by the first combustion, wherein an oxygen-lean (column 4 lines 48-59) oxygenated gas (secondary) is injected (through 26) at a distance $L2$ ($d2$) from the jet of fuel so as to combust with a second portion of the fuel present in the gases output by the first combustion, and in that $L2$ is greater than $L1$ (see fig 3b).

Dugue does not specifically disclose that the primary jets inject oxygen-rich oxygenated gas even though he suggests that (see column 3 lines 46-52).

Khinkis discloses an oxygen enriched combustion system (fig 1) wherein oxygen-rich gas is first provided for sub-stoichiometric combustion of the fuel (column 3 lines 46-51) before the fuel is further reacted with oxidizer (see fig 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Dugue's invention by using oxygen-rich oxygenated gas for the primary sub-stoichiometric combustion in order to provide a furnace with enhanced efficiency and reduced NOx emission as taught by Khinkis (column 1 lines 10-13).

With regard to claim 16 Dugue does not specifically disclose that the area of the cross section of the injection orifice for the oxygen-lean oxygenated gas is between 4 and 100 times the area of the injection cross section for the second jet of oxygen-rich oxygenated gas. However, fig 3b shows that the diameter of the second jet of oxygen-rich orifice 30 is $d3$ the diameter of the oxygen-lean orifice 38 is D . One notes from

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columns 3 lines 5-45 and column 5 lines 16-26 that the maximum value of $D = d_2/5$; $d_3 \geq d_1/10$; $d_2 \geq d_1$ (but in fig 3b $d_2 > d_1$); hence D is greater than d_3 . Therefore Dugue's disclosure suggests that the area of the cross section of the injection orifice for the oxygen-lean oxygenated gas is larger than that of the second jet of oxygen-rich oxygenated gas injection orifice.

The limitation that the oxygen-lean oxygenated gas injection orifice area to be between 4 and 100 times the injection cross section area of the second jet of oxygen-rich gas is deemed a matter of optimization within prior art conditions; "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) MPEP 2144.05 II A. In this case Dugue discloses the general condition that the oxygen-lean oxygenated gas injection orifice area is larger than the injection cross section area of the second jet of oxygen-rich gas as discussed above

With regard to claim 17 Khinkis also discloses wherein the oxygen-rich oxygenated gas has an oxygen concentration of greater than 30% by volume (column 3 lines 46-48).

With regard to claim 18 Dugue also discloses wherein the oxygen-lean oxygenated gas has an oxygen concentration of at most 30% by volume (less than 30%) (column 4 lines 48-59).

With regard to claim 19 Dugue also discloses wherein the distance L1 is between 5 and 20 cm ($d1 < 30$ cm) (column 3 lines 5-7).

With regard to claim 20 Dugue also discloses wherein the distance L2 is greater than 30 cm ($d2 < 63$ cm, derived from data in column 3 lines 29-31, 35-38).

With regard to claim 21 Dugue also discloses wherein the quantity of oxygen injected by the jets of oxygen-rich oxygenated gas represents 10 to 50% of the total quantity of oxygen injected (column 3 lines 46-51).

With regard to claim 23 Dugue also discloses wherein the oxygen-lean oxygenated gas is preheated before being injected (column 4 lines 49).

With regard to claim 29 Khinkis also discloses using the method of claim 16 for heating a glass charge or for a reheat furnace (column 3 lines 1-2).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Dugue's invention by using the method of claim 16 for heating a glass charge in order to provide a furnace with increased heat transfer to the furnace load and reduced NOx emission as taught by Khinkis (column 1 lines 10-13).

With regard to claim 30, the method of claim 16 is capable of being used when a continuous production of oxygen is interrupted or when the production is not interrupted. It is within the purview of one of ordinary skill in the art to use bottled oxygen when the production of oxygen is interrupted and to use oxygen from the production line when the production of oxygen is not interrupted. For example Koppang (US 5,759,022) discloses the use of bottled liquid oxygen in a combustion system (fig 3), oxygen from an oxygen

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production line can also be used in this set-up by connecting the line to the compressor 41 when the liquid line is not used.

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dugue in view of Khinkis and further in view of Koppang et al 5,759,022. Dugue in view of Khinkis teaches the invention as claimed and as discussed above except for the oxygen-rich oxygenated gas being derived at least partly from a liquid oxygen storage unit.

Koppang discloses a combustor wherein the oxygen-rich oxygenated gas is derived at least partly from a liquid oxygen storage unit 38 (fig 3A).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Dugue in view of Khinkis's invention by including the use of liquid oxygen from a storage unit in order to provide a means of stocking large quantity of oxygen which can be easily replenished to minimize production interruption.

With regard to method claims 16-21, 23-24 and 29-30 through the normal use and operation of Dugue in view of Khinkis and further in view of Koppang's invention discussed above the limitation of method of use recited in claims 16-24 and 29-30 will inherently be met.

Allowable Subject Matter

Claims 25-26 are allowed.

Response to Arguments

Applicant's arguments with respect to claims 16-26 and 29-30 have been considered but are not persuasive. Examiner notes that Applicant's argument in pages 6-7 is convincing as to why the area of the cross section of the injection orifice for the oxygen-lean oxygenated gas has to be larger than that of the second jet of oxygen-rich oxygenated gas injection orifice; namely to avoid excessive velocity of the high volume of air flow required to replace the oxygen-rich oxidizer flow, when the plant runs out of the oxygen-rich oxidizer. Applicant's arguments failed to disclose why the ratio of the areas has to be specifically between 4 and 100. The limitation that the ratio should be between 4 and 100 is deemed a matter of optimization within prior art conditions as discussed in the rejection.

Applicant's arguments with regard to the earlier rejection of claims 25 and 26 are not convincing as discussed above. However, claims 25 and 26 are allowed as a result of the amendment to the claims that overcame the earlier 112 rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHUKA C. NDUBIZU whose telephone number is (571)272-6531. The examiner can normally be reached on Monday - Friday 8.30 - 4.30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Rinehart can be reached on 571-272-4881. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

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Examiner, Art Unit 3743

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/Kenneth B Rinehart/

Supervisory Patent Examiner, Art Unit 3743